

Project Baseline Summary Report

Data Source: **EM CDB**

Operations/Field Office: **Richland**

Site Summary Level: **Hanford Site**

Project **RL-VZ01 / Site-Wide Groundwater/Vadose Zone Integration Project**

Report Number: **GEN-01b**

Print Date: **3/9/2000**

HQ ID: **0084**

General Project Information

Project Description Narratives

Purpose, Scope, and Technical Approach:

Purpose: The Hanford Site environmental legacy represents one of the most complex technical, regulatory, and public policy challenges facing the nation. Past operations at the Hanford Site resulted in radiological and chemical contamination of soils (vadose zone), groundwater, and the Columbia River. While progress is being made, individual cleanup project decisions and goals (end points) do not necessarily lead to a technically defensible and publicly acceptable end state.

To address this situation, the U.S. Department of Energy (DOE) established (December 1997) the Hanford Site Groundwater/Vadose Zone (GW/VZ) Integration Project (Integration Project) to fulfill its commitment to assure the protection of water resources, the Columbia River environment, river-dependent life, and users of Columbia River resources. DOE Undersecretary Moniz directed that the project be science-based, that it include strong participation from the DOE national laboratories, and that it incorporate a multi-tiered peer review process.

Scope: The Integration Project has developed a vision and a science-based plan to systematically address the issues of fragmentation, defensible cleanup end points, and credibility in the Hanford Site's approach to achieving its environmental restoration mission.

Integration -- The Integration Project has defined the work scope (core projects) to be integrated at the Hanford Site, and is coordinating this work to the fullest extent possible. Core project team members are co-located and meet frequently to share information and plans. Additionally, other regional studies by the states of Oregon and Washington, and other agencies (U.S. Geological Survey [USGS], Bonneville Power Administration [BPA], U.S. Army Corp of Engineers, etc.), will be examined for applicability to Integration Project activities. The Integration Project will establish formal procedures and requirements in time for the development of an integrated project work plan for FY2000. The DOE will transmit a letter to Ecology and the EPA outlining a proposed approach for developing an integrated regulatory framework for 200 Area assessment and remediation activities. The DOE would like to initiate discussions with the regulators in early calendar year 1999.

Technical Approach: In order to accomplish its mission, the Integration Project is establishing the Hanford Site's technical foundation for predicting the transport of existing and future contaminants through the vadose zone, groundwater, and the Columbia River to receptors (i.e., affected organisms). The Integration Project is employing a systems approach to develop and assemble the scientific understanding, data, and capability required to evaluate the cumulative impacts of Hanford Site operations, as well as proposed corrective actions and remediation alternatives for regional water resources and receptors. This approach involves an iterative process for establishing an understanding of the system (a conceptual model), developing and exercising a System Assessment Capability (SAC) (models, analytical tools, and data needed for affects assessments), and defining uncertainties and requirements for science and data in order to fill gaps.

The Integration Project divides its work into eight technical elements. The relationships within and between elements are coordinated through the system assessment. Through a series of workshops with local experts, scientists from the national laboratories, and interested members of the public key deficiencies were identified for several of these elements. From this analysis, an applied S&T program has been developed for which a project-level S&T roadmap has been drafted.

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Another important aspect of the Integration Project mission is to establish consistency and compatibility among the Hanford Site's characterization and assessment project (core projects). Core projects were evaluated and opportunities for enhancements were identified in the context of a Long Range Plan (LRP). The LRP identifies near and long-term decisions requiring assessments of the potential regional effects of these decisions (utilizing the SAC). The LRP also identifies required interconnections and dependencies.

Sixteen technology needs are directly associated with the Groundwater/Vadose Management and Integration PBS. These needs were derived from the Science and Technology Activities of the Groundwater/Vadose Zone Integration Project Specification (DOE-RL-98-48) and define the technical gaps associated with the scope of work for the four technical elements described in detail in the project specification. The titles for these needs are listed below and are organized by the project technical element that they support.

Vadose Zone Technical Element

- RL-SS27: Use of field data from representative sites to elucidate controlling features and processes for contaminant distribution.
- RL-SS28: Understand, quantify and develop descriptions of reactions and interactions between contaminants of concern and vadose zone sediments.
- RL-SS29: Develop descriptions of contaminant flow and transport in the vadose zone.
- RL-SS30: Understand and quantify water movement in the vadose zone using uncontaminated field sites.
- RL-SS31: Provide advanced characterization tools and methods to delineate contaminant plumes in the vadose zone and relate plume distribution to the distribution of geochemical and hydrogeological properties.

Groundwater Technical Element

- RL-SS32: Understand and quantify the relationship between contaminant sources, vadose zone plume properties and groundwater plume properties with a focus on the groundwater-vadose zone interface.
- RL-SS33: Provide means to delineate regional groundwater plumes in three dimensions and define a scientific basis for addressing scaling issues in Hanford groundwater.
- RL-SS34: Understand, quantify and develop descriptions of biogeochemical reactions and interactions between contaminants of concern and aquifer sediments to describe biochemical reactive transport.
- RL-SS35: Provide means to quantify the flux of contaminant between the groundwater and the Columbia River.

River Technical Element

- RL-SS36: Provide means to integrate regional-scale phenomena via a conceptual model into assessments of contaminant impacts on the Columbia River.
- RL-SS37: Provide means to translate groundwater contaminant flux information into information useful at the scale of river impact assessments.
- RL-SS38: Understand, quantify and develop descriptions of reactions and interactions between contaminants of concern and sediments in the river and bank-storage region.
- RL-SS39: Understand and provide means to quantify the impacts of river contamination on receptors.

Inventory Technical Element

- RL-SS40: Provide a method to develop holistic inventory estimates.

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- RL-SS41: Understand and quantify the solubility of contaminants of concern at the waste vadose zone sediment interface.
- RL-SS42: Provide method for more accurate estimates of waste constituent release rates and modes from waste.

Project Status in FY 2006:

The project would have transitioned from an integration and system assessment capability development mode to a general way of operations for the projects and maintenance of the system assessment capability.

Post-2006 Project Scope:

The project would have transitioned from an integration and system assessment capability development mode to a general way of operations for the projects and maintenance of the system assessment capability.

Project End State

This project establishes the integration process and provides tools for assessing the cumulative impacts. As such, it supports other projects and their associated cleanup decisions and does not result in a project endstate.

Cost Baseline Comments:

The cost estimates were developed using a detailed process of developing scopeing statements, estimates and schedules. Hanford contractor representatives participated collaboratively in developing the near-term plan.

Safety & Health Hazards:

The GW/VZ Project integrates the ongoing groundwater and vadose zone activities and provides the assessment tools necessary to support the Hanford Projects cleanup decisions. While failure to proceed with this project would likely result in significant difficulty for the Hanford Site in technically defending the risks and impacts associated with the cleanup decisions. The project itself does not mitigate any direct public, worker or environmental risk.

Safety & Health Work Performance:

The resources necessary to accomplish the work safely are provided through the Authorization Basis, the Site Health and Safety Program requirements, and through the resources allocated to the site's integrated safety management system in the following functional categories: radiological controls, emergency management, fire protection, industrial hygiene, industrial safety, occupation medical services, management and oversight, transportation safety, nuclear safety and management oversight.

ER resources are planned and allocated into these categories by functional responsibility through the work breakdown structure and resource loaded into the project for each fiscal year. Average hourly labor rates vary among projects based on the work scope and related skills mix.

The Emergency Preparedness functional task includes inspection of emergency facilities and equipment; emergency response team personnel training, drills and exercises relative to personnel contamination; construction accident response; maintaining/updating the current emergency plan based on site-specific hazards; coordination with state and local authorities and federal agencies; responses to worker injuries; and recordable occurrences and

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Project Description Narratives

of normal events.

The Fire Protection functional task includes related inspections and testing; flammable and explosive material control; review design plans/specifications for compliance with regulations, codes, and standards; and review and concurrence of work packages.

The Industrial Hygiene functional task includes the Chemical Management system, anticipation, recognition, evaluation and control of health hazards; redesign of equipment and tasks; review and approval of work packages; design of airborne fiber wetting systems; respiratory protection standards; respiratory protection equipment supplies; substitution of less hazardous materials; written and verbal communication of real and perceived hazards; personnel protection, and asbestos fiber counts and sample analysis.

The Industrial Safety functional area includes electrical safety; machinery and pressure system safety; hoisting; rigging, and material handling, lockout/tagout; confined space controls; platform, man-lift and scaffolding usage; safe surfaces for walking and working; hand and portable power tool safety; explosives and hazardous material handling, construction safety; review of work packages; site surveillances or subcontractor review.

The Management and Oversight functional task includes S&H documentation, action tracking; S&H self assessment activities; internal audits and surveillance; external S&H program reviews; operational readiness reviews; and Voluntary Protection Program (VPP); trend analysis; lessons learned; coordination and communication with DOE, state and local authorities.

The Management, Oversight, and Reporting functional task includes the coordination of project environmental protection plans, documentation and control, information management, compliance and corrective action tracking, appraisals and self assessments and general environmental monitoring and coordination.

The Occupational Medical Services functional task includes medical scheduling, labor and industries, and OSHA reporting; oversight of the Site Occupational Medical provider; hazardous worker or asbestos worker pre/post-job medical screening coordination, tracking; and case management.

The Nuclear Safety functional task includes providing direction for the implementation of DOE Orders and Standards related to nuclear safety. In addition, the functional group assists the projects in the development, implementation, and oversight of the safety analysis process.

The Radiation Protection functional task includes radiation monitoring equipment and procedures for radiation controls, oversight of personnel and facilities, radiation control monitoring, interlocks, instrumentation for shielding for radiation-generating devices; equipment and procedures used to minimize or mitigate external exposures; and personnel dosimetry, bioassay program, and radiation-exposure records.

The Transportation Safety functional task includes the activities required to ensure safe packaging and transportation of asbestos, radioactive and hazardous materials, and approval of D.O.T. shippers and container documentation.

NOTE: The amount of funding made available for this PBS in any fiscal year will determine the work that will be performed, which will, in turn, be a basis for adjustment in the associated S&H requirements.

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Project Description Narratives

PBS Comments:

Baseline Validation Narrative:

The GW/VZ Project was initiated in mid 1998 and remains in the development stage in FY 1999. There has been review of the estimates during the planning and Detailed Work Plan process but there has been no validation.

General PBS Information

Project Validated?

Date Validated:

Has Headquarters reviewed and approved project?

Yes

Date Project was Added:

Baseline Submission Date:

FEDPLAN Project?

Drivers:	CERCLA	RCRA	DNFSB	AEA	UMTRCA	State	DOE Orders	Other
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Project Identification Information

DOE Project Manager: R. A. Holten

DOE Project Manager Phone Number: 509-376-7277

DOE Project Manager Fax Number: 509-376-4360

DOE Project Manager e-mail address: richard_a_holten@rl.gov

Is this a High Visibility Project (Y/N):

Planning Section

Baseline Costs (in thousands of dollars)

	1997-2006 Total	2007-2070 Total	1997-2070 Total	1997	Actual 1997	1998	Actual 1998	1999	2000	2001	2002	2003	2004	2005	2006
PBS Baseline (current year dollars)	98,423	205,883	304,306					12,014	12,000	13,657	14,013	15,403	15,192	7,979	8,165

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Baseline Costs (in thousands of dollars)

	1997-2006 Total	2007-2070 Total	1997-2070 Total	1997	Actual 1997	1998	Actual 1998	1999	2000	2001	2002	2003	2004	2005	2006	
PBS Baseline (constant 1999 dollars)	90,160	103,439	193,599					12,014	11,685	12,948	12,924	13,819	13,246	6,774	6,750	
PBS EM Baseline (current year dollars)	98,423	205,883	304,306					12,014	12,000	13,657	14,013	15,403	15,192	7,979	8,165	
PBS EM Baseline (constant 1999 dollars)	90,160	103,439	193,599					12,014	11,685	12,948	12,924	13,819	13,246	6,774	6,750	
	2007	2008	2009	2010	2011- 2015	2016- 2020	2021- 2025	2026- 2030	2031- 2035	2036- 2040	2041- 2045	2046- 2050	2051- 2055	2056- 2060	2061- 2065	2066- 2070
PBS Baseline (current year dollars)	7,817	8,066	8,275	8,498	16,852	19,267	21,996	25,130	28,562	32,823	28,597	0				
PBS Baseline (constant 1999 dollars)	6,292	6,322	6,315	6,315	11,569	11,577	11,568	11,568	11,509	11,576	8,828	0				
PBS EM Baseline (current year dollars)	7,817	8,066	8,275	8,498	16,852	19,267	21,996	25,130	28,562	32,823	28,597	0				
PBS EM Baseline (constant 1999 dollars)	6,292	6,322	6,315	6,315	11,569	11,577	11,568	11,568	11,509	11,576	8,828	0				

Baseline Escalation Rates

1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
		0.00%	2.70%	2.70%	2.80%	2.80%	2.90%	2.70%	2.70%	2.70%	2.70%	2.70%
2010	2011-2015	2016-2020	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050	2051-2055	2056-2060	2061-2065	2066-2070

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2010	2011-2015	2016-2020	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050	2051-2055	2056-2060	2061-2065	2066-2070
2.70%	2.70%	2.70%	2.70%	2.70%	2.70%	2.70%	2.70%	2.70%	2.70%			

Project Reconciliation

Project Completion Date Changes:

Previously Projected End Date of Project:

Current Projected End Date of Project: 9/30/2044

Explanation of Project Completion Date Difference (if applicable):

Project Cost Estimates (in thousands of dollars)

Previously Estimated Lifecycle Cost (1997 - 2070, 1998 Dollars):

Actual 1997 Cost:

Actual 1998 Cost:

Previously Estimated Lifecycle Cost of Project (1999 - 2070, 1998 Dollars):

0

Inflation Adjustment (2.7% to convert 1998 to 1999 dollars):

0

Previously Estimated Lifecycle Cost (1999 - 2070, 1999 Dollars):

0

Project Cost Changes

Cost Adjustments Reconciliation Narratives

Cost Change Due to Scope Deletions (-):

Cost Reductions Due to Efficiencies (-):

Cost Associated with New Scope (+):

Cost Growth Associated with Scope Previously Reported (+):

Cost Reductions Due to Science & Technology Efficiencies (-):

Subtotal:

0

Additional Amount to Reconcile (+):

193,599

Current Estimated Lifecycle Cost (1999 - 2070, 1999 Dollars):

193,599

Milestones

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Milestone/Activity	Field Milestone Code	Original Date	Baseline Date	Legal Date	Forecast Date	Actual Date	EA	DNFSB	Mgmt. Commit.	Key Decision	Intersite
Begin Site-Wide Gnd Wtr/Vadose Zone Integ. Project	PBS-99-001		10/1/1998								
PBS Mission Completion	PBS-MC-042		9/30/2044								
PBS Project End	PBS-PE-042		9/30/2044								

Milestones - Part II

Milestone/Activity	Field Milestone Code	Critical Decision	Critical Closure Path	Project Start	Project End	Mission Complete	Tech Risk	Work Scope Risk	Intersite Risk	Cancelled	Milestone Description
Begin Site-Wide Gnd Wtr/Vadose Zone Integ. Project	PBS-99-001			Y							Administrative input to document the start of this PBS.
PBS Mission Completion	PBS-MC-042					Y					Administrative input to document the mission completion of this PBS.
PBS Project End	PBS-PE-042				Y						Administrative input to document the project end of this PBS.

Technology Needs

Site Need Code: **RL-SS27**

Site Need Name: **Use of Field Data from Representative Sites to Elucidate Controlling Features and Processes for Contaminant Distribution**

Focus Area Work Package ID: **SS-01**

Focus Area Work Package: **Characterization, Monitoring, Modeling and Analysis**

Focus Area: **SCFA**

Agree with Technology Link: **Y**

Benefits (Cost, Risk Reduction, Both): **Both**

Technologies

Cost Savings (in thousands of dollars)

Range of Estimate

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Technology Needs

Site Need Code: RL-SS28

Site Need Name: Understand, Quantify and Develop Descriptions of Reactions and Interactions between Contaminants of Concern and Vadose Zone Sediments

Focus Area Work Package ID: SS-01

Focus Area Work Package: Characterization, Monitoring, Modeling and Analysis

Focus Area: SCFA

Agree with Technology Link: Y

Benefits (Cost, Risk Reduction, Both): Both

Technologies

Cost Savings (in thousands of dollars)

Range of Estimate

Site Need Code: RL-SS29

Site Need Name: Develop Descriptions of Contaminant Flow and Transport in the Vadose Zone

Focus Area Work Package ID: SS-01

Focus Area Work Package: Characterization, Monitoring, Modeling and Analysis

Focus Area: SCFA

Agree with Technology Link: Y

Benefits (Cost, Risk Reduction, Both): Both

Technologies

Cost Savings (in thousands of dollars)

Range of Estimate

Site Need Code: RL-SS30

Site Need Name: Understand and Quantify Water Movement in the Vadose Zone Using Uncontaminated Field Sites.

Focus Area Work Package ID: SS-01

Focus Area Work Package: Characterization, Monitoring, Modeling and Analysis

Focus Area: SCFA

Agree with Technology Link: Y

Benefits (Cost, Risk Reduction, Both): Both

Technologies

Cost Savings (in thousands of dollars)

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Project **RL-VZ01 / Site-Wide Groundwater/Vadose Zone Integration Project**

Technology Needs

Site Need Code: RL-SS31

Site Need Name: Provide Advanced Characterization Tools and Methods to Delineate Contaminant Plumes in the Vadose Zone and Relate Plume Distribution to the Distribution of Geochemical and Hydrogeological Properties

Focus Area Work Package ID: SS-11

Focus Area Work Package: Validation, Verification, & Long-Term Monitoring of Containment & Treatment

Focus Area: SCFA

Agree with Technology Link: Y

Benefits (Cost, Risk Reduction, Both): Both

Technologies

Cost Savings (in thousands of dollars)

Range of Estimate

Site Need Code: RL-SS40

Site Need Name: Provide a Method to Develop Holistic Inventory Estimates

Focus Area Work Package ID: SS-01

Focus Area Work Package: Characterization, Monitoring, Modeling and Analysis

Focus Area: SCFA

Agree with Technology Link: Y

Benefits (Cost, Risk Reduction, Both): Both

Technologies

Cost Savings (in thousands of dollars)

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Technology Needs

Site Need Code: RL-SS42

Site Need Name: Provide Method for More Accurate Estimates of Waste Constituent Release Rates and Modes from Waste

Focus Area Work Package ID: SS-01

Focus Area Work Package: Characterization, Monitoring, Modeling and Analysis

Focus Area: SCFA

Agree with Technology Link: Y

Benefits (Cost, Risk Reduction, Both): Both

Technologies

Cost Savings (in thousands of dollars)

Range of Estimate

Site Need Code: RL-SS36

Site Need Name: Provide Means to Integrate Regional-Scale Phenomena via a Conceptual Model into Assessments of Contaminant Impacts on the Columbia River.

Focus Area Work Package ID: SS-01

Focus Area Work Package: Characterization, Monitoring, Modeling and Analysis

Focus Area: SCFA

Agree with Technology Link: Y

Benefits (Cost, Risk Reduction, Both): Both

Technologies

Cost Savings (in thousands of dollars)

Range of Estimate

Site Need Code: RL-SS37

Site Need Name: Provide Means to Translate Groundwater Contaminant Flux Information into Information Useful at the Scale of River Impact Assessments

Focus Area Work Package ID: SS-01

Focus Area Work Package: Characterization, Monitoring, Modeling and Analysis

Focus Area: SCFA

Agree with Technology Link: Y

Benefits (Cost, Risk Reduction, Both): Both

Technologies

Cost Savings (in thousands of dollars)

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Technology Needs

Site Need Code: RL-SS38

Site Need Name: Understand, Quantify and Develop Descriptions of Reactions and Interactions Between Contaminants of Concern and Sediments in the River and Bank-Storage Region

Focus Area Work Package ID: SS-01

Focus Area Work Package: Characterization, Monitoring, Modeling and Analysis

Focus Area: SCFA

Agree with Technology Link: Y

Benefits (Cost, Risk Reduction, Both): Both

Technologies

Cost Savings (in thousands of dollars)

Range of Estimate

Site Need Code: RL-SS39

Site Need Name: Understand and Provide Means to Quantify the Impacts of River Contamination on Receptors

Focus Area Work Package ID: SS-01

Focus Area Work Package: Characterization, Monitoring, Modeling and Analysis

Focus Area: SCFA

Agree with Technology Link: Y

Benefits (Cost, Risk Reduction, Both): Both

Technologies

Cost Savings (in thousands of dollars)

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Technology Needs

Site Need Code: RL-SS32

Site Need Name: Understand and Quantify the Relationship Between Contaminant Sources, Vadose Zone Plume Properties and Groundwater Plume Properties with a Focus on the Groundwater-Vadose Zone Interface

Focus Area Work Package ID: SS-09

Focus Area Work Package: Access and Delivery Systems

Focus Area: SCFA

Agree with Technology Link: Y

Benefits (Cost, Risk Reduction, Both): Both

Technologies

Cost Savings (in thousands of dollars)

Range of Estimate

Site Need Code: RL-SS33

Site Need Name: Provide Means to Delineate Regional Groundwater Plumes in Three Dimensions and Define a Scientific Basis for Addressing Scaling Issues in Hanford Groundwater

Focus Area Work Package ID: SS-11

Focus Area Work Package: Validation, Verification, & Long-Term Monitoring of Containment & Treatment

Focus Area: SCFA

Agree with Technology Link: Y

Benefits (Cost, Risk Reduction, Both): Both

Technologies

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Technology Needs

Site Need Code: RL-SS34

Site Need Name: Understand, Quantify and Develop Descriptions of Biogeochemical Reactions and Interactions Between Contaminants of Concern and Aquifer Sediments to Describe Biochemical Reactive Transport

Focus Area Work Package ID: SS-01

Focus Area Work Package: Characterization, Monitoring, Modeling and Analysis

Focus Area: SCFA

Agree with Technology Link: Y

Benefits (Cost, Risk Reduction, Both): Both

Technologies

Cost Savings (in thousands of dollars)

Range of Estimate

Site Need Code: RL-SS35

Site Need Name: Provide Means to Quantify the Flux of Contaminant Between the Groundwater and the Columbia River

Focus Area Work Package ID: SS-01

Focus Area Work Package: Characterization, Monitoring, Modeling and Analysis

Focus Area: SCFA

Agree with Technology Link: Y

Benefits (Cost, Risk Reduction, Both): Both

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Technology Needs

Site Need Code: RL-SS25

Site Need Name: Improved, Cost-Effective Methods for Sub-Surface Access to Support Characterization and Remediation

Focus Area Work Package ID: SS-09

Focus Area Work Package: Access and Delivery Systems

Focus Area: SCFA

Agree with Technology Link: Y

Benefits (Cost, Risk Reduction, Both): Both

Technologies

Cost Savings (in thousands of dollars)

Range of Estimate

Site Need Code: RL-SS26

Site Need Name: Improved Methods for Determining Distribution of Beta Emitting Contaminants in Subsurface Soils

Focus Area Work Package ID: SS-11

Focus Area Work Package: Validation, Verification, & Long-Term Monitoring of Containment & Treatment

Focus Area: SCFA

Agree with Technology Link: Y

Benefits (Cost, Risk Reduction, Both): Both

Technologies

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